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REDUCED ENERGY TILLAGE SYSTEMS

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In This Issue

Cover: Minimum tillage allows planting directly into the last harvest stubble. This issue looks at the pros and cons of reduced energy tillage systems for Quebec.

urnal Jottings

quite some time, and with in-
asing frequency, I have had
ssing my desk press releases, ar-
es, and publications making men-
, mostly with enthusiasm, of suc-
sful minimum and no-tillage
tems. Labour-saving, energy-
ing, soil conservation, and good
ds were some of the positive
ements. I approached Professor
ard McKyes, Chairman of the
partment of Agricultural Engineer-
and suggested a special issue
ecued energy tillage systems
ed specifically at Quebec and
tern Canada. He agreed to the
e but felt it would come out
nding rather negative for this
based on research to date,
ough they may find success in
e areas of the would. It seems
his colleagues in this issue con-
for the most part.

You will find some repetition in the articles. Most of the authors came up with similar observations, particularly on the subject of soils and weeds, and we felt this was worth emphasizing.

Particular thanks go to Marcel Hudon, Senior Entomologist in Charge of the Maize Program at the Agriculture Canada Research Station, St-Jean-sur-Richelieu. His Editorial comments may be found on the next page.

Do read the definitions below of the various systems prior to delving into the articles that follow. To till or not to till — in Quebec — has been the question. We trust this issue will supply you with some answers.

Hazel M. Clarke

REDUCED AND NO-TILLAGE SYSTEMS

System	Definition
No-Tillage	Only the seed emplacement zone is worked, possibly up to 25% of the field surface area. Includes no-till, till-plant, chisel-plant, rotary strip tillage, mulch tillage, ridge rows, and the like.
Minimum Tillage	The total field area is worked but less severely or less often than in conventional tillage.
Conventional Tillage	All the topsoil is inverted or mixed by ploughing, power tilling, and/or multiple disking.

Editorial

Minimum, No-Tillage Versus Conventional Cropping Systems

Tillage practices in agriculture have changed considerably during the last 20 years. In the past, ploughing and the cultural practices were to destroy weeds and to improve soil structure for plant cultivation. Today, weed destruction can easily be obtained with selective herbicides, but what still puzzles the agronomes is the soil structure maintenance after many mechanical field operations. New methods of soil preparation and seed planting using selective chemicals are challenging former conventional tillage practices. The no-tillage concept has been progressively practiced in many areas in the world for its potential agricultural production value where soil and water supply were available. The term *no-tillage* designates a procedure where the crop is planted directly into a chemically killed crop residue with no prior mechanical seedbed preparation; *minimum tillage* is that the total field area is worked but less than in conventional tillage.

In this presentation, let us consider the extreme concepts, the no-tillage and the conventional methods of cropping. Before 1960, little research was reported on minimum or no-tillage; it is during the last decade that both were seriously considered. At the time, it was mostly evaluating the tillage effects on plant growth and grain yields. Today, the comparison between no-tillage and conventional methods goes further and considers all the possibilities between the overall agronomic and economic value of the two concepts. Reasons exist for such agricultural ventures where *pros* and *cons* are often advocated by researchers. In the United States (1975), a survey of minimum tillage technology in crop production indicated that growers will try for the next few decades to capitalize at an accelerated rate on the advantages of that system. By reducing tillage operations it was thought that considerable savings in energy, farm equipment, labour, and time could be obtained, along with moisture conservation, lowered soil temperatures in summer and erosion prevention. Most minimum or no-tillage systems were used with major crops such as corn, small grain, sorghum and soybeans, but other crops including vegetables are being considered. Crops with a short growing season seem well suited to minimum tillage production since weed control is less of a problem. The surface mulch of no-till cropping may allow field harvesting machinery when moisture conditions would make conventionally-tilled fields impassible, particularly for vegetable crops that have to be harvested in a very short time.

Studies made during the last decade revealed highly different conclusions for both tillage practices, i.e., maize yields from no-tillage may vary by 25 per cent less or more than with the conventional method. Factors such as the climatic and soil conditions are responsible for such differences and this complicates the decision for the farmers.

Several soil and moisture conditions are affected by tillage operations. Minimum tillage methods that maintain a mulch or organic material on the surface usually have better rainfall infiltration, reduce the quantity of water wasted normally by evaporation, and reduce wind and water erosion — factors important on slope lands. But no-tillage lowers soil temperature by a few degrees and retards the early growth of plants, the recovery of P and K elements by plants, the breakdown of the organic matter and the release of its nutrients by soil micro-organisms. Such conditions become more critical in northern agricultural areas than for the southern parts of the US or the Mediterranean zone where the longer growing season

(Continued on Page 1

Marcel Hudon, second from right, with staff from Agriculture Canada, Laval, and Macdonald standing beside a Buffalo no-till planter.

Is minimum tillage a good idea for the soils of Quebec?

y Professor A. F. MacKenzie
epartment of Renewable
esources

› minimize tillage is to reduce
bour, fuel costs, and wear and
ar on machinery while at the same
ne improve soil organic matter. So
ny not reduce cultivation to an ab-
olute minimum? But will the soils
ill provide a good seedbed for
en, fast germination? Can fertilizer
added as effectively? What soils
e most adapted to minimum
age? Will crop yields remain high?

lage is of two kinds — primary
age or ploughing. In primary
age the shearing and moulding
tion of the plough cause the soils
form large masses or clods, in-
spersed with pores and spaces
air and water to enter the soil.
condary tillage then breaks down
ese larger clods into finer granules
d aggregates, producing the "just-
ht" combination of air and water
ention, and easy penetration of
int roots and emergence of seedl-
js. Tillage at the wrong moisture
ntent can be disastrous: a too-wet
il producing massive clods of in-
netrable soil, or a too-dry soil be-
resistant to further breakdown of
ods. In clay soils the margin for er-
is very small. Yesterday they
y have been too wet; tomorrow
ey'll be too dry. Sandier soils are
s massive, more easily broken
wn and thus cultivation is a less
tical matter.

ltivation, of course, produces the
sential seedbed but also causes
janic-matter destroying aeration
the soil, increased soil erosion,
d enhanced moisture losses. Thus
tivation is a "necessary evil".

nventional tillage by means of fall
ughing, with resulting freezing
d thawing of clods over winter
owed by spring disking, results in
iable soil, ideal for planting, for
water penetration from rainfall, for reduced erosion losses, and for incorporation of plant residues. Fertilizer and lime applications are possible at plough depth where they can do the plant roots some good.

Primary tillage produces large masses of soil interspersed with spaces for air and water to enter the soil.

Cultivation of a too-wet clay soil produces massive clods.

Ketcheson at Guelph found over a period of six years that reduced tillage or no-tillage for continuous corn production on silt loam soils resulted in poorer yields. Yield reductions of up to 18 per cent were noted, and there was no indication that increased fertilizer use could overcome these yield depressions due to reduced tillage. Tougher subsoils with no-tillage resulted in reduced root penetration, even though moisture levels in the no-till soils were higher. Conventional fall ploughing was best, followed by fall-ridging and fall mulch tilling, all of which were superior to no-till in production of grain and stover.

Left: Sandy soils require minimum tillage to produce a good seedbed.

Below: Flat clay soils of Quebec often benefit from fall ploughing to maintain good soil conditions.

In contrast, corn yields under no-till conditions in Virginia were higher than with conventional tillage. Yet Van Doren and his co-workers in Ohio found that corn yields were on the average little affected by tillage practices. However, they did say that no-till treatments produced substantial yield losses on some poorly drained soils but apparently only on continuous corn. Crop yields were not affected by tillage techniques on a crop rotation of corn, oats, and alfalfa-meadow. On the other hand, no-tillage treatments had greater yields than ploughed treatments on some well drained, sloping soils. These yield increases with no-till seemed to be a result of water conservation — a result of the presence of mulches and of a stable, improved soil structure.

Griffith and co-workers have concluded that for Indiana soils, reduced germination and poor weed control are a problem with no-plough tillage systems. These problems, they conclude, are more likely to be severe on poorly drained clay soils than on well drained coarse soils. No-till planting seems to be well adapted on loam and sandy loam soils. However, these workers warned that no single no-plough system was equally well developed to all soils. Better than average management with no-plough systems was needed to control weeds, insects, and disease.

Tillage studies carried out here at Macdonald by Keith MacMillan and Professor G. Millette were somewhat inconclusive, but showed that plough-plant or ridging techniques produced grain yields equal to conventional tillage, except in the Ste-Rosalie clay where north-south ridging reduced yields. Lower yields seemed to be found where soil temperatures were lowest. Thus, any cultural treatment that warms the soil may have value in early crop growth.

Thus, tillage seems to be most important on our flat, clay soils in order to maintain good soil tilth. Fall ploughing on these soils is particularly beneficial in providing a good seedbed in the spring. On sandy soils, tillage becomes less important as these soils are naturally more open, and moisture contents are not too important when tilling. Thus they can be disked in the spring and still provide a good seedbed. In fact, these sandy soils may be our best candidates for minimum tillage.

In most of these studies fertilizer placement was not a problem in no-till systems. Broadcast fertilizer was often as efficient except for fertilizer P. In the case of P fertilizers, some planning to arrange for pre-plant application was necessary.

So if we want to take advantage of no-till or minimum till systems, we should be using them on sandy loam to loam soils and be prepared to put in more time in managing these crops for weeds, insects, and disease. We may need to consider rotations, with deep-rooted legumes and other forage species, to loosen up the sub-soil, and occasional plough down applications of fertilizer P and limestone will still be required.

In Quebec we are going to be restricted to using minimum tillage on our lighter textured soils as found on the stony glacial till soils and sandy alluvial soils, and we may have to avoid its use on the level, flat, wet clay soils of the Montreal plain. Thus about 40 per cent of the plain of Montreal is composed of clay textured soils and, therefore, may be unsuitable to minimum tillage as now practiced. Of the remaining soils, another 25 per cent will be unsuitable due to a combination of excessive water or low fertility. So we are left with about one third of our soils that can be used for minimum tillage.

If we do use minimum tillage on these well drained, sandy soils with reasonably high fertility, we may expect gains in soil organic matter levels, in moisture retention, in reduced erosion, in improved structure and, ultimately, in better yields. But we will have to experiment to get the right combination of tillage and crop sequence for each soil and area.

Reduced and No-Tillage Systems

/ Professor Edward McKyes,
epartment of Agricultural
ngineering

uch of the information for this article is
m P. W. Unger and T. M. McCalla, Ad-
nces in Agronomy, Vol. 33, pp. 1-58, 1980.)

ontemporary reduced and no-age practices began primarily as soil conservation measure in drier eas of North America where soil sses were severe on bare fields e to the wind. Plant residues left the soil surface aid greatly in ducing both wind and water ero-n of fertile topsoil and tend to ow the soil to conserve more isture, which is important in dry eas of the United States, Europe, pan, and Africa. Because weeds re not inverted as they would be mouldboard ploughing, they were ways a considerable problem sociated with such systems. wever, weeds grow less quickly the drier regions where these stems are popular and, in any se, they have been controlled re effectively by the development new herbicides in recent years. urther motive for implementing ch practices is the present high st of fuel, which is consumed in ich greater quantity during con-ntional tillage operations and ich is a far more influential factor n it was back when diesel oil st the farmer four cents per litre less.

ble 1 shows the commonly used luced and no-tillage systems ether with the special machinery uired to accomplish the prac-es. The particular implements ed are not as expensive as a trac-, which is needed for all forms of chanized agriculture, but most not advantageous should one h to return to conventional tillage erations. The purchase of these ecialized machines should be delayed until the farmer is assured that the relevant cultivation system is indeed suited to his soils, climate, and combination of crops.

In view of the present knowledge of the performance of plant-soil environments with respect to physical, chemical, and biological effects, it is difficult to say in which applications reduced or no-tillage systems would be profitable. In many instances, the adoption of these cultivation methods has resulted in marked decreases in crop yields and quality for one particular reason or a combination of effects. A summary of some of the detrimental events which can arise follows.

Annual machinery operations, including cultivation, seeding, application of fertilizer and pesticides, and harvesting can cause intense compaction in the topsoil. Severe compaction is detrimental to crop growth because of reduced soil permeability, aeration, water holding capacity and root penetration. Conventional tillage usually serves to relieve compaction effects in the tilled zone each year. This process is especially important in humid climatic regions, where a high rate of soil water drainage is needed, and compaction damage is increased manyfold due to wet soil conditions at the time of heavy machinery traffic. Offsetting this effect is the fact that the maintenance of a higher soil organic content in many of the reduced tillage schemes actually keeps the soil structure looser and more biologically active, in the absence of other influences. Furthermore, a certain degree of soil compactness is beneficial in dry areas, since it aids in the conservation of soil moisture, in seed germination, and in water retention during periods of drought.

Weeds, which compete vigorously with crops for water, nutrients, and light, are much more of a problem when conventional tillage is not used, because their seeds are not buried, they germinate better on firm uncultivated surfaces, subsequent cultivation can be difficult on hard ground, and herbicides are not incorporated in the soil. The use of herbicides to control weeds is not always successful in cases of resistant species and shifting populations, especially in humid zones.

TABLE 1: Common reduced and no-tillage systems

System	Special Equipment	Energy Use	Soil Erosion	Surface Residue	Weed Problems
1. Fall plough, shallow cultivation at planting	Seeder with sweeps	High	Medium (Coarse surface)	Very low	Low-medium
2. Spring plough before wheel track planting	Seeder with wheels	High	Short duration	High	Medium
3. Fall chisel, shallow cultivation at planting	Seeder with sweeps	Low-medium	Medium	Medium	High
4. Fall and spring light disking	Seeder with sweeps	Medium	Medium	Medium	Low-medium
5. Till plant on ridges	Disk or rolling ridger, seeder with sweeps	Low	Low	High	Medium
6. Strip tillage	Rotary tiller in strips (20 cm wide)	Low	Low	High	Medium
7. Direct drill	Seeder with strong sweeps and furrow openers	Low	Low	High	High

Thus, a return to a certain level of tillage is often necessary. Insects and plant diseases can follow a similar pattern, with greater problems occurring in reduced or no-tillage circumstances.

Another factor which is influential, especially in regions of cold weather and a short growing season, is the effect that surface crop residues have on soil temperature. Thick layers of crop residues have an insulating effect and usually a higher reflectance to light rays than bare soil. This reduces the rate at which heat can enter the soil and decreases its temperature in the springtime. In cold wet areas, a lower soil temperature has an adverse effect on the melting of ice, water evaporation, seed germination, and plant growth. Favourable soil temperatures for germination and seedling emergence can occur weeks later than normal in this case, and the soil moisture content stays higher, reducing root growth and machinery trafficability, and increasing the susceptibility of the soil to compaction.

In the final analysis, a change from conventional tillage to a reduced or no-tillage system will result in economic benefit only if the crop yields improve, or decrease just slightly. Taking into account machinery operation and herbicide expenses, production costs may be reduced by up to 50 per cent for some crops using limited tillage practices. In other instances, the expenses may not differ much between conventional and reduced tillage systems. But, whatever the savings in input costs, the adoption of a different cultivation technique cannot prove profitable if the crop yields are decreased severely owing to one or more of the factors of soil structure alteration, low ground temperatures, weeds, insects, or plant diseases.

It is not surprising, then, that reduced or no-tillage systems have seen very limited application in Quebec, or in most of the northeastern part of this continent for that matter, since in these areas the detrimental factors have been found usually to cause a drop in crop production which outweighs any savings in time, energy, or other expenses which might derive from the adoption of such practices.

Weeds and Less Tillage

by Professor A. K. Watson
Department of Plant Science

Weeds interfere with the growth of agricultural crops by competing for light, water, nutrients, and space. The major detrimental effect of weeds is the reduction of crop yields. Today, as in the past, much of a farmer's time and energy is spent on weed control. There are various methods of weed control available including: preventive, physical, managerial, biological, and chemical. Of these general methods, tillage and the application of herbicides constitute the major portion of weed control practised at the farm level.

Tillage — A Weed Control Method

Prior to the discovery and general use of organic herbicides, tillage and other physical methods were the mainstay of weed control. The wide spacing of row crops was governed by the necessity for tillage. Tillage has been used to: (1) provide a suitable seedbed for crop establishment, (2) incorporate crop residues into the soil, (3) physically alter soil structure (such as breaking up clay clods), and (4) reduce or eliminate weed competition. With the appearance and general use of herbicides, the different functions of tillage could be compared in the absence of weed populations. These studies suggested that in most circumstances tillage provided little benefit to crop production other than weed control.

As a weed control tool, tillage can adversely effect weed populations by: killing young weed seedlings, burying viable weed seeds, disrupting the growth of perennial weed species, providing a uniform surface for subsequent herbicide applications, being an integral part of preplant incorporated herbicide treatments, and loosening the upper soil layer which facilitates subsequent tillage operations. Depending upon the condition of the final seedbed, tillage may decrease weed seed germination if a uniform firm seedbed is prepared. In some cases, tillage may even be responsible for the promotion of weed growth. For example, tillage may stimulate dormant weed seeds to germinate, bring viable weed seeds to the soil surface, through seedbed preparation provide an ideal environment for weed seed germination, and cause the proliferation and spread of underground reproductive structures of perennial weed species. Despite these limitations, tillage is still a valuable weed control measure.

It is obvious that if tillage is not to be utilized as a weed control method in reduced tillage or no-tillage systems, herbicides must be relied upon for effective weed control.

·Ierbicides and Reduced Tillage

'he importance of effective her-ıicides has been expressed in all eports on reduced tillage systems no-till, minimum till, etc.). Inade-Iuate weed control is the major miting factor in reduced tillage ystems. However, the development f effective "knockdown" herbicides uch as paraquat and glyphosate as permitted reduced tillage ystems to become a reality in ome areas. The success of a no-till r reduced till row crop depends on chieving complete vegetation con-rol at planting time and maintaining relatively weed-free surface for a ritical period after planting (approx-mately six weeks).

'or each no-till or reduced tillage rop, an appropriate herbicide ystem must be employed. Paraquat as been described as the mainstay of no-till farming." Para-Iuat is a contact herbicide which rovides extremely rapid control of xisting vegetation but no residual ctivity in the soil. Similarly, lyphosate has no residual activity ı the soil, but this herbicide is ranslocated into the plant root ystems providing control of many erennial weed species. Both of nese herbicides are used as knockdown" herbicides to remove xisting vegetation at time of plant-ng. These herbicides must then be ollowed by residual, soil-applied erbicides that persist in the soil to rovide for the control of ger-ninating weeds as the crop is ecoming established. Post-mergent herbicides can be subse-uently used to obtain control of veeds which have become stablished with the crop. Various re-emergent and post-emergent erbicides are available for different rops and one of the following ublications should be consulted for ecommended herbicides for astern Canada:

- **Mauvaises herbes (Agdex 640) Répression.** Ministère de l'Agriculture des Pêcheries et de l'Alimentation, Gouvernement du Québec
- **Guide to Chemical Weed Control.** Publication 75, Ontario Ministry of Agriculture and Food.

Tillage is a major tool in row crop weed control.

Reliance on Herbicides for Weed Control

In the absence of tillage, these no-till or reduced tillage systems essentially rely solely on herbicides for weed control. Reliance on only one strategy will ultimately lead to problems. Major weed population shifts have been observed to occur in reduced tillage systems. Weed species which are tolerant to the herbicide treatments have increased, and difficult to control perennial weeds, such as quackgrass and yellow nutsedge, have become major problems. Crop residues left on the soil surface in a reduced tillage system may adversely affect the performance of subsequently applied herbicides. These residues are responsible for interception of herbicide spray and the inactivation of herbicide molecules by adsorption. The effectiveness of many surface applied herbicides is dependent upon subsequent rainfall for activation and movement into the soil. If dry weather persists after herbicide application, the conventional tillage system has the option of mechanically incorporating the herbicide into the surface layer of soil. In the no-till system the herbicide is lost. Finally, in reduced tillage systems, the option of utilizing effective preplant incorporated (PPI) herbicides is removed. These herbicides are applied to the soil surface before planting and must be incorporated immediately into the top few centimetres of soil. Obviously in a reduced or no-till system PPI herbicides have no place.

To overcome some of the weed problems associated with the reliance on chemical weed control, suitable crop rotations can be selected. Other managerial aspects including appropriate fertilizer application and increased seeding rates could be utilized to ensure the crop exhibits its optimum competitive ability to the detriment of associated weed species.

Reduced Tillage Systems for Eastern Canada

In eastern Canada the fertile soils, the adequate supply of moisture, and sufficiently long growing season provide near optimum conditions for the growth of many crops. These conditions are also most advantageous for the growth of associated weeds and the dramatic negative effect of weeds on crop yields has been demonstrated many times. The success of any cropping system (as expressed in crop yield) whether no-till, reduced tillage, or conventional tillage is very much dependent upon the level of weed control. No-till or reduced tillage systems eliminate or severely restrict the use of tillage. As a result, successful weed control must be achieved almost entirely with the application of herbicides. Like other methods of control, herbicides have their limitations, and it is unlikely that adequate weed control could be economically maintained with soil reliance on herbicides on no-till systems in eastern Canada.

OTHER BIOLOGICAL EFFECTS

ANIMALS

by Professor W. N. Yule
Department of Entomology

It has been found that numbers of earthworms in soil increase with reduced tillage operations, and that their beneficial burrowing activities, which improve aeration, drainage and nutrient circulation, become even more important in compacted untilled soil. This increase in earthworm numbers and activity is promoted by the reduced physical disturbance and the higher organic matter content found in untilled soils, especially in surface layers. Other animals which are similarly involved in decomposition activities and in increasing soil fertility, ranging from microscopic Protozoa to mites and insects, would also be encouraged under reduced tillage conditions. On the other hand, the accumulation of plant debris on the surface of untilled soil might indirectly reduce the beneficial activity of the soil fauna by their screening effect and consequent lowering of soil temperatures, especially in spring and early summer. Also, the increased use of herbicides required in minimum tillage operations might alter soil faunal composition or reduce their activity, depending on the herbicides used and on the dosage and frequency of their application.

The accumulation of surface trash would be likely to encourage certain animal pests of crops, such as slugs, field mice and other rodents, and birds such as starlings. Mechanical destruction and exposure by ploughing and disking of soils is a traditional cultural control method for chronic insect pests such as white grubs and wireworms. Also, the burying of crop debris by deep ploughing in the fall is required to reduce overwintering success of serious local pests such as the European cornborer. Furthermore, if reduced cultivation practices were accompanied by restricted rotation of crops, insect pest damage would be likely to increase; for example, corn rootworms would be encouraged by continuous corn culture. If some of these insect pests were encouraged by reduced cultivation, insecticide use might also have to be increased with even more harmful effects on beneficial soil animals than those predicted for the required heavy use of herbicides.

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MICRO-ORGANISMS

by Professor R. Knowles
Department of Microbiology

Partial or complete elimination of tillage of soils results in a more compact, somewhat wetter, and less aerated soil mass. It has been found that the content of total carbon, nitrogen, and water may be as much as 25 per cent higher in no-till situations than in corresponding ploughed soils. The total biomass of microorganisms is also higher. For example, the populations of aerobic (oxygen-requiring) microorganisms may be 10 to 80 per cent higher, and populations of anaerobes (those which are killed by oxygen) can be 60 to 300 per cent higher in no-till conditions.

The higher organic matter content and higher microbial biomass suggests that there is a somewhat greater potential for the tie-up or immobilization of applied fertilizer, and this has, indeed, been shown in some studies in the United States. One would expect that this might be a relatively short-term phenomenon, and that the fertilizer element or elements would be released later as organic matter decomposition proceeds and as the microbial biomass itself is subject to decomposition. It is not always easy to decide whether the results of research carried out in other parts of Canada and the United States can be applied directly to conditions in Quebec, but the general principles can most likely be applied.

With regard to the availability of nitrogen, some studies suggest that because of the more reducing conditions in no-till soils the available inorganic nitrogen tends to remain somewhat more in the ammonium form. This is due to a certain decrease in the nitrifying activity of the soil, which means that ammonium is not oxidized so rapidly to the more leachable form, nitrate. It has been reported from a Kentucky study that no-till soils have a greater potential for denitrification. That is, the loss of inorganic nitrogen by a reduction of nitrate to gaseous products, mainly nitrogen, which are released to the atmosphere. This would be undesirable. However, it may be irrelevant if, as is suggested above, there may be much less nitrate produced in no-till soils.

In general, it seems that there is probably less loss of essential nutrient elements in no-till situations partly due to a greater tie-up or immobilization of these elements in inorganic matter and biomass. These elements would, therefore, be expected to become gradually available as the organic matter and biomass undergo decomposition.

Reference

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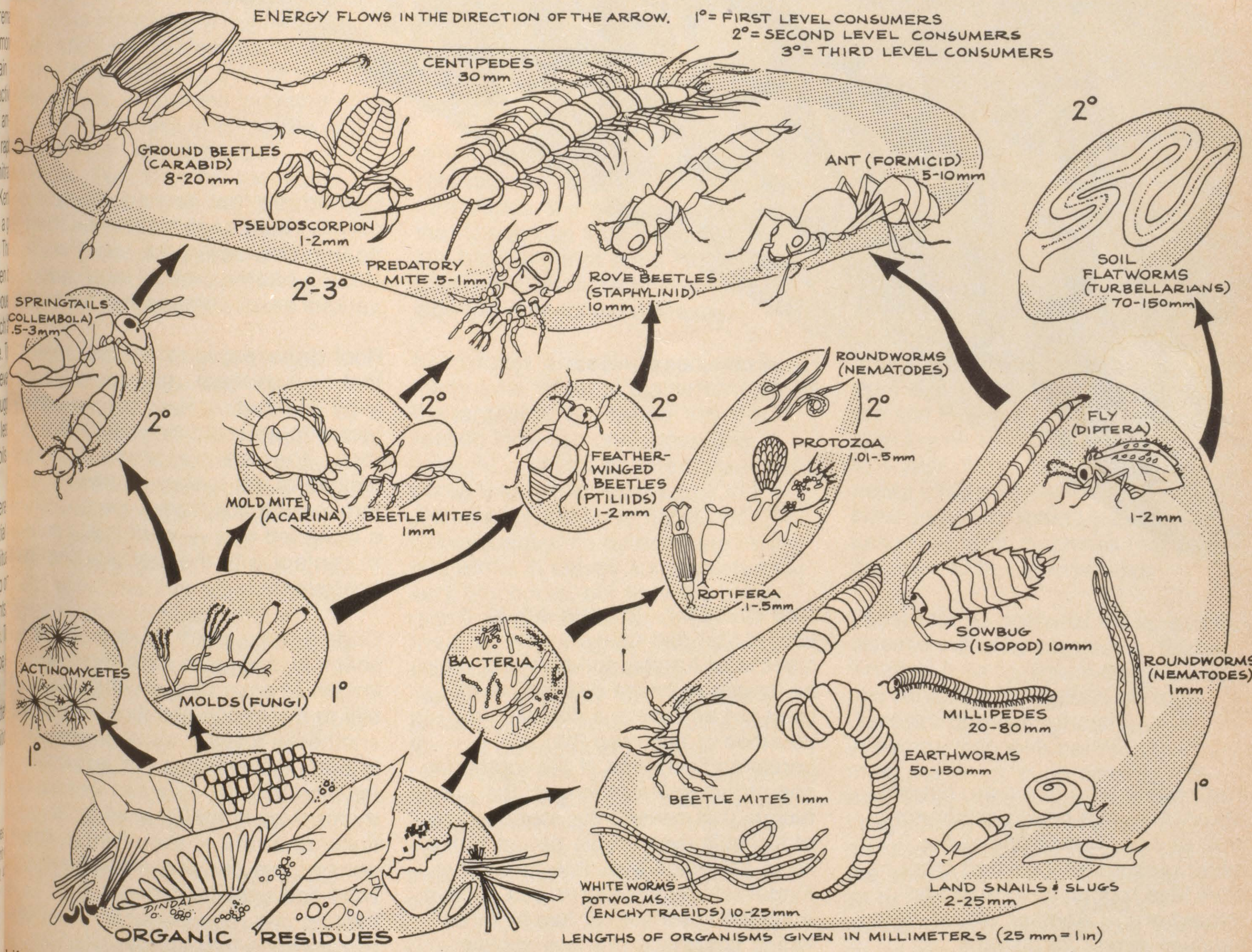
ROOT DISEASES

by Professor R. H. Estey
Department of Plant Science

Although very little research has been carried out to accurately assess the effects of tillage on root diseases, and their causes, one can state with reasonable certainty that, in general, tillage has little overall effect on the incidence or the severity of the root diseases that commonly occur on agricultural crops in eastern Canada. There are, of course, many exceptions to this general statement and to understand either the general statement or its exceptions one needs to consider the nature of the organisms that cause root diseases, and how they live and survive in soil.

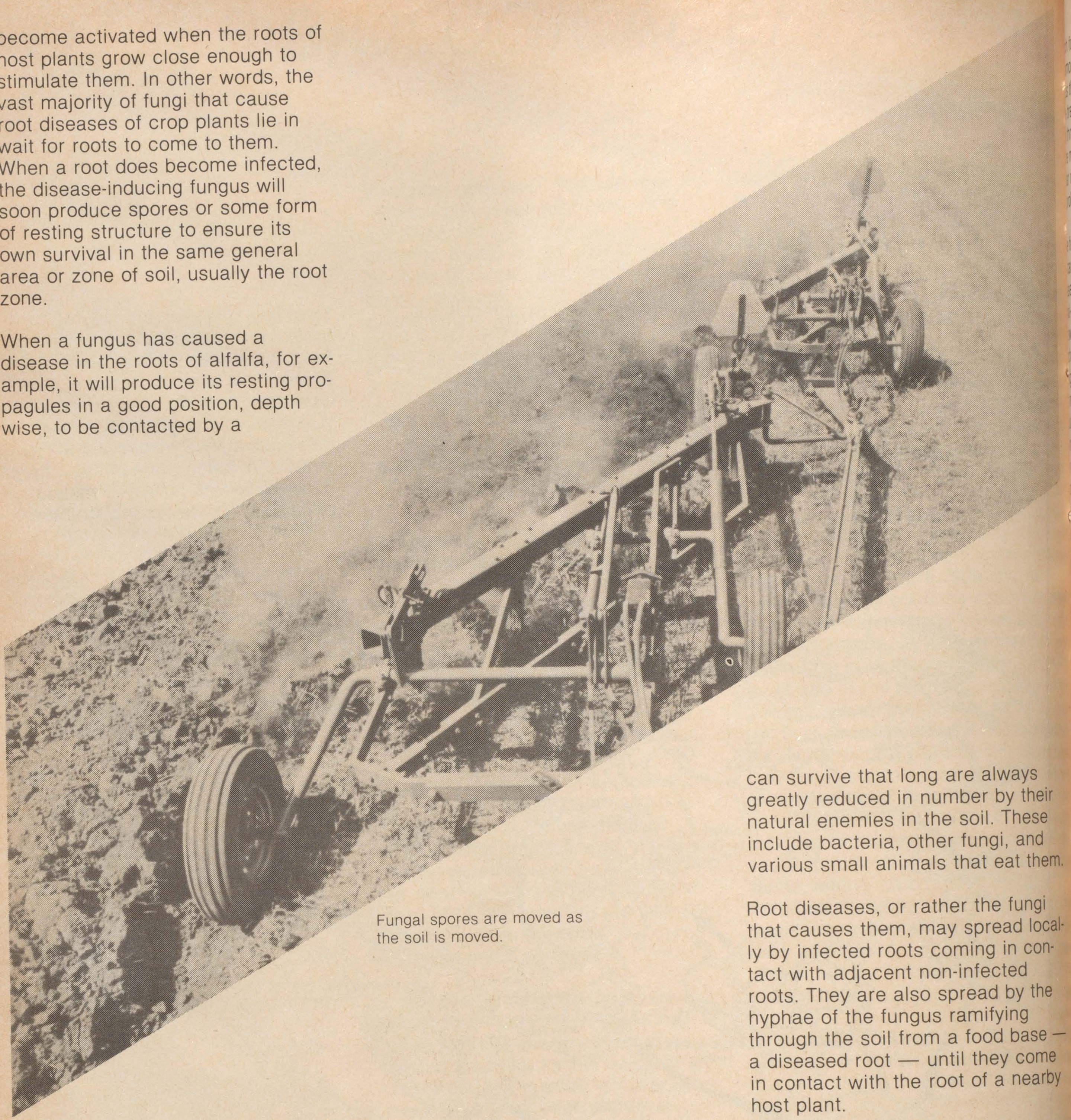
Most root diseases are caused by fungi which, when actively growing, have thread-like bodies called hyphae that tend to spread in all directions from a source of food. However, at any given time most disease-inducing fungi are inactive in the soil, being there in the form of dormant spores or other "resting" structures. These resting structures



Life in the soil. Illustration by Dr. Daniel L. Dindal.

become activated when the roots of host plants grow close enough to stimulate them. In other words, the vast majority of fungi that cause root diseases of crop plants lie in wait for roots to come to them. When a root does become infected, the disease-inducing fungus will soon produce spores or some form of resting structure to ensure its own survival in the same general area or zone of soil, usually the root zone.

When a fungus has caused a disease in the roots of alfalfa, for example, it will produce its resting propagules in a good position, depth wise, to be contacted by a



Fungal spores are moved as the soil is moved.

succeeding crop of alfalfa, but not necessarily in a good position for a crop of oats. This is one of the minor reasons why rotated crops have less root disease than non-rotated crops. Another reason is because most root disease organisms have a certain amount of host specificity. In other words, a fungus that can cause a root disease of turnips, for example, may be unable to cause disease, or at least not as severe a disease, in potatoes or any crop that is unrelated to turnips. If the rotation is one of five years or longer, the fungus that caused the root disease of turnip is likely to die before turnip roots are again available to it. Most fungal resting structures can survive in undisturbed soil for two or three years, but only a few can survive longer than five years. Those that can survive that long are always greatly reduced in number by their natural enemies in the soil. These include bacteria, other fungi, and various small animals that eat them.

Root diseases, or rather the fungi that causes them, may spread locally by infected roots coming in contact with adjacent non-infected roots. They are also spread by the hyphae of the fungus ramifying through the soil from a food base — a diseased root — until they come in contact with the root of a nearby host plant.

Certain fungi, such as *Rhizoctonia solani* and species of *Pythium*, are known to grow through and over wet soil to infect one seedling plant after another in a relatively short period of time. If conditions are just right for their growth, they can extend themselves laterally, in all directions, at a rate of about two to three centimetres per day. A few fungi twist and entwine some of their hyphae into rope-like strands called rhizomorphs that are designed to grow faster than the others in their

search for new host plants. Rhizomorphs of *Armillaria mellea*, a fungus that can parasitize and kill apple trees, have been known to grow through orchard soil at a rate of one metre per growing season. Similar rhizomorphs of other fungi can probably grow just as fast.

Some fungi, including many of those that cause the "damping off" disease of seedling plants, produce animal-like spores called zoo-spores that swim through the soil water in search of suitable food materials, including living plants. However, the vast majority of root disease fungi produce non motile propagules or resting structures that remain where they were produced unless transported through the pores of the soil by the movement of water, by insects, worms, and other carrier organisms that inhabit the soil.

Many fungal spores are moved as the soil is moved by ploughs, harrows, and other tillage machinery. From this standpoint, that of the local spread of disease-inducing organisms, the act of tilling the soil does have an effect on root diseases. Furthermore, the movement of tillage machines from farm to farm provides a means of spreading these organisms from infected to non-infected areas on the same farm or to distant farms.

In cultivated soil fungi are most numerous in the surface layers where they are readily disturbed by tillage practices. Nevertheless, the plus and minus factors of tillage, relative to root disease, more or less balance one another so that the over-all effect, one way or the other, is usually negligable. For example, tillage practices that spread certain disease-inducing organisms to favourable places may at the same time move others to less advantageous positions in the soil — either buried too deeply, brought too near the surface of the soil, or otherwise moved to positions where they will not be close enough to host plants to be affected by them.

Although most soil fungi are in the upper layers where they may be disturbed by tillage machinery, they are frequently numerous at depths where they are never directly disturbed by tillage operations. This means that diseases of deep-rooted crops are less likely to be affected by tillage than are those of shallow-rooted crops. It also means that any minor alleviating effect that tilling operations may have on root diseases caused by fungi in the upper layers of soil is likely to be of short duration or to last only until the roots grow into a less disturbed part of the soil.

When soil conditions are suitable for the germination and subsequent growth of the seeds of crop plants they are likely to be equally suitable for the germination and subsequent growth of fungal spores that may infect them. However, in many instances a well nourished, healthy plant can escape or ward off diseases induced by fungi. On the other hand, any tillage practice, or the lack of it, that tends to inhibit the growth of a plant, to damage it or otherwise render it unthrifty, will almost invariably make it more susceptible to fungi that cause root diseases.

When consideration is given to the root diseases that are caused by nematodes, the general statement that tillage has little over-all effect is still basically true but it needs to be qualified a bit more than when considering only fungal diseases.

Nematodes are eel-shaped worms many time larger in diameter than the largest fungal hypha. For this reason they can only move and multiply in soils with interconnected pores that are at least equal to the diameter of the adult nematodes. Consequently, nematodes are rarely numerous in clayey soils which have very tiny pores, but they are commonly so numerous as to be troublesome in sandy soils. Any tillage practice that tends to "loosen" a clayey soil will have a tendency to increase the potential for root diseases induced by nematodes whereas any practice that makes a soil significantly more compact will tend to limit the movement of nematodes and thus reduce their potential for causing root diseases.

Nematodes, like the zoo-spores of certain fungi, spread locally by swimming between soil particles in the interconnected films of water. When a soil becomes dry the nematodes in it cannot move, and rapid drying commonly occurs in the uppermost layers of soil when it is being tilled. If there is dust blowing behind a harrow or cultivator, the soil is probably so dry near the surface that nematodes are being immobilized and killed as a consequence of the rapid drying.

Fallowing is a very effective means of reducing the population of nematodes in a soil if no weeds or other plants are allowed to grow there. In this instance more nematodes would die of starvation than from drying although both processes would be operating in a well fallowed field. Most plant parasitic nematodes can survive through weeks or even months of wet, cold conditions but they cannot tolerate rapid drying or a prolonged period in a relatively warm environment without food in the form of plant roots.

Tilling, or any farming operation that moves soil from place to place, provides a means for the long distance movement of nematodes and, consequently, the spread of nematode-induced diseases just as it does for fungus-induced diseases. Nematodes themselves are capable of moving relatively short distances in soil. Because of their blind, random movements in the darkness of the soil they are unlikely to move laterally more than about one metre in a year, thus local spread within a newly infected field is usually quite slow unless assisted by cultivators and other farm machines that move particles of soil across fields.

Except for its potential for spreading disease-inducing organisms, tillage, whether it be minimum-tillage or not, has relatively little effect on root diseases of most agricultural crops, in comparison with certain other farming practices, such as crop rotation. Tillage of any kind has such an insignificant long term effect on root diseases that decisions concerning the amount of tilling, or whether to till or not, should be based on economic and other factors, but not on its effect on root diseases.

Crop Production With Reduced Tillage Systems

by Professor Norman C. Lawson
Director, Diploma Program
and Associate Professor,
Department of Plant Science

Undoubtedly farmers since the beginning have been conscious that their greatest challenge to survival was to set-up a workable system to ensure stability and sustainability of yield in the crops they were growing for their sustenance. Farmers soon learned that climate was a variable over which no control could be exerted. On the other hand, cultivation or tillage was something that the most primitive of man could carry out initially by hand and he could then study and discuss with others the value, effects, and merits of his sometimes puny efforts.

For many centuries crops have been produced with tillage systems that manipulate the soil a number of times. The conventional system used well into the 1940s in corn production areas consisted of ploughing, followed by tilling with a disk-harrow three or four times to break clods, followed by harrowing to smooth the surface and to complete the preparation of a fine firm seedbed. Planting would then take place followed by as many cultivations as possible until the stalks grew so high that they were broken by equipment going through the field. Hand labour was used to hoe or pull weeds missed by the cultivator until the corn was shoulder high.

Tillage could require 10 or more trips over the field prior to harvest. A 100-acre family farm might typically have 20 acres planted to row crops. Row crop acreage was limited, first, by the labour required to produce the crop, second by the need to grow legumes to provide nitrogen for the row crop and, third, by the forage and feed requirement of the teams of horses needed for farm power.

The introduction of power equipment for tillage and the greater use of fertilizer nitrogen over the last four decades has had a profound effect in increased worker productivity and row crop acreages on farms but has not markedly reduced the number of tillage operations used to produce the crop. Similar tillage systems have been used for most row crops while close planted crops such as small grains received less tillage because of the difficulty of cultivating for weed control without causing damage after the crop has emerged.

The well known dust bowl conditions that developed in the 1930s in many parts of North America were due to a combination of factors. A shortage of moisture meant no crop growth. Wind erosion of bare soil took place. Subsequent intensive rainfall on rolling terrain caused more erosion. Undoubtedly the enthusiastic use of the mouldboard plough was a contributing factor to the serious loss of topsoil in many parts of North America.

"Plowman's Folly" written by E.H. Faulkner in 1943 was a stimulating book widely read by students for at least a decade. In its time, this book created a great deal of controversy and prompted a number of studies. However, none of the systems that eliminated mouldboard ploughing were widely adopted, primarily because of the inability of farmers to maintain suitable weed control.

The most profound influence on tillage was the discovery of selective organic herbicides. When 2,4-D was introduced in the late 1940s farmers could control many annual broadleaf weeds and could reduce the number of post-emergent cultivations. The introduction of Atrazine about 20 years ago meant that a broad spectrum of weeds could be kept under control and consequently the dream of no tillage corn started to become a reality.

In the 20 years of experimentation that has occurred as a result of the existence of broad spectrum herbicides certain trends have become clear. No-tillage is most advantageous on rolling terrain where erosion is a problem. Multiple cropping becomes more practical permitting rapid establishment of the second crop and also by conserving moisture present in the soil by maintaining mulch cover and leaving the soil undisturbed.

In the United States, corn constitutes the greatest acreage of all crops grown with the no-tillage system. Double crop soybean and pasture renovation represents significant acreages while reduced tillage production of other crops is very minor. The primary reason for these differences is the availability of suitable herbicides for the various crops. When more efficient herbicides are developed we can foresee reduced tillage in soybeans and other crops.

With different tillage systems there may be conflicting problems. Reduced tillage practices decrease soil erosion losses dramatically but may increase the load of herbicides or insecticides in runoff. The question of the total energy budget for crop production is important. The full energy saved by reduced tillage is partially offset by the energy required to produce additional pesticides for the reduced tillage system.

In the last decade in the North East and North Central United States there has been a slow but steady adoption of the reduced tillage philosophy.

What is the situation in Quebec today? Quite simply there has been very little interest so far in reducing or modifying our traditional tillage procedures associated with seed-

bed preparation, while herbicides have been used widely in place of cultivation for weed control. We have very little local research data, at this time, on the value and validity of the reduced tillage approach. We know from past experience that crop response to tillage changes dramatically with changes in climate, soil texture, and previous crop history. We know that research results from western Canada, Europe, and the United States may be limited in their applicability in Quebec. We also know that research funds are extremely limited these days and we cannot test and evaluate by experimentation interesting transfered technology suggestions over adequately long periods of time.

The articles presented in this issue have been produced in the hope that the reader will learn something about the complexity of the problem and that corn and soybean producers will realize that our traditional tillage concepts can be changed. When you have finished reading about the problem I hope you will remember the three following reasonable conclusions:

1. In coarse sands and gravelly soils a suitable corn seedbed exists without any tillage. Adequate weed control and a zero-till planter will give you a good corn crop.
2. On sandy loam and loam soil a single heavy disking in the spring can be adequate seedbed preparation.
3. On clays, clay loams, and silt loams no other tillage treatment has matched corn yields attained after autumn mouldboard ploughing.

(Continuation from Page 2)

makes it possible to grow two or more crops each year. Soil compaction is normally reduced by the no-tillage practice. Inadequate drainage, excessive tillage with heavy machinery operations, and intensive cash crop systems cause soil compaction and the inevitable reduced root growth is reflected by lower yields. Recent experiments at Macdonald revealed that the highest corn yields were obtained in *moderately* compacted soils.

After all those considerations, it is clear today that the no-tillage system for crop production that was thought to become a miracle in the US corn belt during the 60s has not evolved so rapidly simply because of the numerous problems that growers have encountered, particularly for weeds, insects, and fertilizers. With the no-till practice, every means to obtain a good crop is of a chemical nature and, these days, this becomes more and more expensive. Farmers are still questioning if saving in operational costs and time for no-tillage is feasible, when considering the special costly equipment and more energy power needed for planting and weeding. Increased yields and reduced erosion in sandy loam soils must also be considered.

One thing remains: no-tillage farming is not a cultural method to be used by all growers when they consider the possible appearance of agricultural problems. No-tillage should not be used on all soil types, everywhere. Researchers agree that heavy textured, poorly aerated, imperfectly drained soils need some tillage and minimum or no-tillage cultural practices are not suited to those soils. For a grower, things that may influence which tillage system he may use are yield obtainable, soil workability, water retention, erosion prevention and, in particular, energy savings. With the advent of new adapted planters that can work in heavy plant debris, new resistant varieties to pests, and more highly selective herbicides, the energy costs will certainly bring back deeper studies of this challenged agricultural concept. With new technology and more experience, farmers of many areas will gradually switch to minimum or no-tillage cropping, and it is recommended to start first in a small way to evaluate the potential economic benefits.

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Conclusion X
Corn prod. X

The Family Farm

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THE FEEDING OF BEEF CATTLE

The following comments are from Mr. Daniel Laliberté, adviser in animal production. It is important for the cow-calf operator to become aware of some of the difficulties that the feeders have to face, particularly if he hopes that a feedlot in his region or from outside will buy his calves. These future steers must possess the qualities of growing and finishing which will permit the feedlot operator to live from his production; otherwise he will have to go and look elsewhere.

This article summarizes the aspect of feeding in the process of growing and finishing and the feeder calf producer, who will read it in a constructive manner, will be able to obtain information that will make him better understand the reasons for the new request for animals in the majority of experienced feedlots during the specialized auctions.

The Feeding Program in Feedlots

The growing and finishing of steers is a relatively new production and its success depends on a specialized technique, used efficiently only by serious operators who have an open mind and know the value of animals and of money and who are always looking for any information having to do with the production and who wish to take up the challenge daily of solving problems and learning new ways.

In addition to the experience of the feedlot operator, the feeding represents a tool to be used with care since it can make the differences between success and failure.

The feeding ration given daily is determined from:
1. The value of the feed served, that is to say, the nature (kind), quantity and quality of the forages, grains, concentrates, protein concentrates, and additives available on the farm or on the market.

2. On the weight, sex, type, and conformation of the animal present in the feedlot.

3. The rate of gain aimed at and determined according to the length of the feeding period envisaged, the weight and the grade desired at slaughter.

It is absolutely necessary that the feedlot operator know how to manipulate these data in order to arrive at the combination which will give him the maximum profit.

Silage produced on the farm, which has received adequate fertilization and which is harvested at the proper stage, represents, after a good preservation, the most economical feed to use because the higher the protein and energy content, the most feasible it would be to substitute it for concentrates or grain — always more expensive to obtain.

In growing and finishing, it is essential to have the forage analyzed in order to know its feed value. This will make it possible to determine the complementary feeds that will have to be added in order to meet the requirements of the animal, among other things, a sufficient quantity of protein during the growing period and a large quantity of energy in the finishing period.

The needs for the growing phase can be met in great part by first quality silage. However, it is advantageous to add to the ration a small quantity of grain or concentrates to make the feed more acceptable, while improving the digestibility of the forage. It could be necessary to add some protein supplement if the needs in protein of the animal are not satisfied by the ration at that time.

In the last third of the growing phase, the finishing of the animal requires an appreciable daily quantity of concentrated energy that is found in grain corn or barley.

The feed requirements of an animal vary mainly according to its weight and the rate of gain that the feedlot operator wishes to obtain.

For the same weight, the greater rate of gain desired, the greater will be the needs of the animal. For example, for a 550-pound weight, 1.1 pound of energy and .15 pounds of additional proteins are needed to obtain a daily gain of 2 pounds rather than 1-1/2 pounds.

Also, if the feedlot operator wants to maintain a daily gain of 2 pounds at the 550-pound level as well as 770, the daily requirements will all be greater: .24 pounds of protein and 2.9 pounds of energy when the animal will have reached 770 pounds compared to the 550-pound weight.

The influence of the intake on the performance of the animal is clear because it is impossible to satisfy the needs if for some reason the animal eats less than its capacity. The factors which affect intake are:

—the weight of the animal;
—the quality of the feed;
—the degree of fleshing of the animal (age versus weight);
—the frequency of feeding;
—the presentation of the feed (complete ration or not);
—the percentage of grain in the ration;
—the percentage of moisture in the forage;
—the availability and the quality of the drinking water;
—the surrounding temperature;
—the length of the silage stalks.

In summary, the knowledge of the feeding value of the feed given to the steers and the development which will follow are valuable indicators for the feedlot operator.

For example, small-frame beef steers, fed in such a way as to obtain a daily gain of 2.2 pounds, that, unfortunately, begin to produce fat at 700 to 800-pound weight, will have great difficulty in reaching 1,000 to 1,100 pounds at slaughter and the fat layer will be too thick for the A1 grade; precisely what the market now requires are large carcasses graded A1.

Two choices are available to the feedlot operator in this situation:

a) modification of the feeding program: the feedlot operator modifies his feeding program to make it less rich in energy in order to obtain a rate of gain more adapted to the animal which has a tendency to deposit fat easily. A daily gain of 1.5 to 1.8 pounds would allow these steers to favour their growth rather than favouring too early a fatty deposit, which will slow down development, downgrade the animal at slaughter, and automatically bring less income.

The inconvenience of this choice is the fact that the feeding period is increased by about 100 days with all the problems that are related to this such as additional storage of feed, more financing, etc.

b) No modification of the feeding program: most of the feedlot operators, when they have in their feedlots this kind of animal, choose to continue the regular feeding program because they cannot afford to keep these steers three months longer than forecast. They necessarily expect to obtain a lower price of about 15 cents per pound dress weight when the carcass is small and fat.

Contrary to this example, large-frame beef types and crossbreds will permit a daily rate of gain of 2.2 pounds or more to reach 1,000 to 1,100 pounds and be graded more easily A1. It is this type of animal that the majority of buyers are looking for in the specialized auctions.

Feeding represents only one of the facets of growing and finishing animals. The others are health, management, financing, and marketing (buying and selling). It is evident that, because of its complexity, this specialized production is viable only for a limited number of producers who are quite demanding and have to be in order to live.

Parasites of the Herd

Today in 1981, one can still find herds that are infested with internal and external parasites.

The external parasites are very well known: flies, cattle grubs, fleas, ticks, mites. According to Mr. Réal-Raymond Major, Veterinarian at the Regional Bureau in Noranda, 41.5 per cent of the infested herds with cattle grubs do not receive any treatment.

In addition, let's consider the flies: nearly 46 per cent of the herds are victims of these flies without receiving any treatment. A large number of products are on the market to decrease the losses in dairy cows. These losses are evaluated at approximately 25 per cent of the milk production during the fly season without taking into account the loss in weight.

The internal parasites are found in all species: cattle, sheep, goats, etc.

The symptoms vary according to the location of the parasites, the most frequent being the respiratory and digestive tracts.

In the spring, ostertagiosis causes losses in our herds. On the other hand, in the fall, it is the lung worm that takes on great importance. Cattle deaths are directly related to an infestation of the lung worm. Studies by Todd and Bliss mention that there is a decrease in milk production of 400 to 700 pounds per cow.

Did you know that parasites decrease the appetite by eight per cent in the affected subjects, as well as a loss of 10 per cent in the digestible protein?

Of course, all the names of the parasites will not be listed here, neither will the drugs generally used, but rather let's list five important points to watch for and to do:

— group together the young subjects of the same age on land which has not been contaminated by adults (it should be noted that a few eggs such as ascaris, trichuris, capillaria resist the winter freeze for as long as five years);
— leave the infested pastures without grazing or ploughing for five years;
— use proper deworming treatment with laboratory controls;
— watch for cleanliness in hayracks and all mangers;
— place the mangers at sufficient height above ground so that manure does not contaminate the feed.

RESULTS OF SOME BREEDERS THANKS TO ARTIFICIAL INSEMINATION

The Quebec Artificial Insemination Centre has recently given to 10 breeders of the province of Quebec a "Certificat de Reconnaissance" to underline the exceptional performance in milk production of one of the cows in their herd.

These producers of Ayrshire and Holstein breeds originate from different regions of Quebec. They are Messrs Paul Labrie of Saint-Alexandre de Kamouraska, Germain Pettigrew of Trois Pistoles, Roger Desaulniers of Saint-Boniface, Louis-Marie Lapointe of Jonquière, Guy Fournier of Saint-Valère, Ferme Tolhurst Inc. of Howick, Gérard Fournier of Sainte-Claire, Société Emery & Rochat of Saint-Gérard de Wolfe, Gérard Richard of Rivière-Ouelle, and Raymond Fréchette of Saint-Paul-de-Chester.

Thanks to the more and more intensive use of artificial insemination in dairy herds and thanks to the selection carried out at the farm level, the improvement of the production potential of dairy cattle is making considerable progress from year to year.

More than 20 years ago a standard of 100 per cent was established for the average milk production and fat production of purebred cows of each dairy breed in Canada. For producers, this information is known under the term "Breed Class Average" or BCA. Today, it is a fairly common occurrence that exceptional cows produce at the 200 per cent level for milk and for butterfat. A few produce even more.

The artificial Insemination Centre undertook a new initiative at the beginning of 1980 in planning to give to the cow owners a certificate for those animals which have an average milk and butterfat production 2-1/2 per cent greater than the average of the breed and which have been conceived by one of the bulls used in artificial insemination at the Centre. During 1980, a total of 14 animals produced from bulls from the Centre have completed productions which were higher than this very high level.

The cows of the producers mentioned above are part of an elite group. They have produced between 8,161 and 14,428 kilograms of milk, and between 339 and 553 kilograms of butterfat for an average of 10,612 kilograms of milk and 408 kilograms of butterfat.

These cows, which represent the very peak of genetic improvement and which have taken advantage of the qualities of management of their owners, have produced about 116,700 litres of milk which could have been transformed into either cheese, yoghurt, butter, or other dairy products!

This Month with the QWI

QWI PIONEERS by the Quebec Women's Institutes

QWI PIONEERS, a book commemorating the early WI members, went on sale at the QWI Annual Convention held at Macdonald May 25-28.

In the following quote from the book we learn that Mrs. Beach of Dunham was instrumental in the organization of the first branch of the WI in Quebec in January, 1911:

"When babies came to bless their home, Mrs. Beach was more concerned than ever that proper nutrition and health rules be observed. Mrs. Hoodless in Ontario had become concerned over this problem after she lost her child, and this was when she organized the first Women's Institute. Mrs. Beach began to plan for such an organization in Quebec."

The book has been compiled from stories submitted by branches throughout the province. We get an insight into the life of rural women in the early 1900s when we read: "The WI picnics at Finlin's Grove are pleasant memories. The hay-fork rope was taken down from the barn and put up on the limb of a huge pine tree for a swing. And swing we did! The clothes boiler, tied on the back of the buggy by means of the halter shank, was used to boil water for the tea at the picnic.", or, "Are you girls with automatic washers and driers listening? I forgot to mention that in the pantry we had a large wooden dry sink, the bottom part had doors on it and the flour and cornmeal were kept in short barrels under here. My mother kneaded her bread on a board which fitted over the top of the sink; here, too, she rolled out her pie crusts and cookies. Our kitchen stove was a 'Diamond Rock'', which was made in nearby Bedford. It had a large enough oven to bake six pies at a time and a huge reservoir at the back to heat water."

At the same time we realize the important role the women played in shaping the communities in which they lived: "Anna had been a member of the Planning Committee for the new consolidated school built in 1928, and the WI gave much support to the project. They planted trees, provided pictures for the classrooms, curtains for the teachers' office, paid library expenses for books from McGill University not only for the school but for their members as well."

The following excerpts from Mrs. Dow's story show that our members took responsibility at the federated level of the WI. "The QWI made her a life member of the FWIC in June 1943. As Provincial President and later as President of FWIC from 1943-47,Mrs. Dow hoped to see a national consciousness develop in every WI member." And again, "Mrs. Dow was appointed an Officer of the Civil Division of the Most Excellent Order of the British Empire 'for outstanding service and leadership to patriotic and war causes' in 1946. She received this honour at Government House, Ottawa."

In time their concern for humanity became world wide as manifested by the Associated Country Women of the World projects that have been supported and by the following quote: "Jean Abercrombie represented the FWIC on the ACWW delegation to Lake Success in 1947 (temporary headquarters for the United Nations)."

In this book, published for our seventieth anniversary, we pay tribute to the members who worked faithfully "For Home and Country". It is a bound edition with a soft cover depicting in silhouette a rural scene showing a contrast in costumes of the early 1900s and modern day.

QWI PIONEERS may be ordered through the QWI Office, Box 258, Macdonald Campus of McGill University, Quebec, H9X 1C0.

Book Committee

Library Honours Founders

On February 14, 1981, a group of the **Austin** WI members visited the Memphremagog Library. The object of this visit was to present a framed picture of Mrs. Margaret Corbett, Mrs. Marjorie Mitchell, and Mrs. Agnes Fisher, co-founders of this Library. The picture was presented to Mrs. K. Milne, President of the Library Board, by Mrs. S. Hopps, President of the Austin WI. The picture will be hung in a prominent place in the Library.

At the same time there was a presentation of four lovely books which were donated from the Austin branch. Two of these books were given in memory of former members, Mrs. Margaret Corbett and Mrs. Elizabeth Shurrock. The two other books were in appreciation of the work done for the Library and for the WI by Mrs. Agnes Fisher and Mrs. Marjorie Mitchell.

The Austin WI began sponsoring this Library in 1964 with a small number

of books being housed in the Princess Elizabeth Elementary School. In the fall of that year the city of Magog provided excellent quarters for the Library in the old Post Office building, and community interest resulted in 5,000 books on the shelves.

It was necessary for the Library to move again in 1971 and, this time, a Magog businessman, George Girard, offered the basement of his office building on Main Street, and the Library has been located there ever since.

The growth of the Library has been rapid, and it had been realized for a long time that it could not continue to be solely supported and operated by the small group of Austin WI members. A city committee was formed under the chairmanship of Mrs. Marjorie Mitchell of the Austin WI. This committee was to discuss the possibility of the community taking over the Library, and this resulted in the Library being constituted a corporation with a Board of Directors and George Girard was elected President.

In 1974 the city of Magog increased its annual grant to $5,000 making it possible for the directors to engage a salaried librarian. Until then the Library had been operated solely by volunteers.

Today there are 20,000 books on the shelves in French and English, and citizens of Magog are proud of their Library and it is apparent that it is wanted and needed in the community. The Austin WI continues to support this project with donations, books, and hours of time to ensure its continued growth.

Austin WI at Memphremagog Library presenting a picture, left to right: J. Robinson, C. Gillick, K. Milne, S. Hopps and A. Patterson.

Members also presented four books. Left to right: B. Langlois, Assistant Librarian, J. Robinson, C. Gillick, C. Cooke, Librarian, K. Milne, S. Hopps and A. Patterson.

A Clarification

In a recent Journal it inadvertently appeared as if the WI Booth at the Cookshire Fair was only for Sawyerville WI. In fact, the Booth is a **Compton County** WI project with all members of the six branches sharing the work equally. The money earned in this manner goes into a Bursary Fund and is given to high school graduates who are continuing their education. At the present time three Bursaries are given each year.

Dear Members

I have been pleased to see the lovely selection of pictures that have been published in the past few issues of the Journal. Here is the second part of the reports of the counties Montcalm to Stanstead.

Rawdon reported a very busy winter season. In January they presented one of their Life Members with an Abbie Pritchard Throw and decided to continue to support a family in India through the "Save a Family" plan. They also donated $200 to the Rawdon Elementary School to buy books for the library and $100 was given to a student obtaining the highest marks at the Joliette High School at last June's graduation. On Valentine's and St. Patrick's Day they entertained the patients of two local hospitals.

The monthly meetings of **Valcartier** have been discussed on radio, television, and in the local newspaper. A complete resumé of the work done by this branch was published in the Quebec Chronicle Telegraph. To increase awareness of the WI, they cooperated with the local Council in sponsoring a Canada Birthday Party. They treated the schools at Christmas and Hallowe'en as well as made a bus trip to Floralies.

Richmond Hill held an auction; the proceeds went toward school prizes. Quilt blocks were given out to be embroidered with the flowers of each province.

The motto at **Melbourne Ridge:** "Life is like a ladder, you can go up and down." At their meeting they asked the members for their oldest treasure and many beautiful articles were shown and interesting stories produced.

Gore gave each member food for thought with the question: "How do you rate yourself as a WI member?" All were urged to take part in the J&P Coats and the QWI competitions. The Welfare and Health Convener turned in several knitted items to be given to somebody in need.

Mrs. Authur Gage, Stanbridge East WI, was recently presented with an Abbie Pritchard Throw by Mrs. Ruby Moore.

Inverness members at the celebration of their 60th Anniversary. Front row, left to right: Mrs. Iva Wright, Mrs. Alice Muir, Mrs. K. Cox. Back row: Miss Adeline Gingras, Mrs. B. Robinson, Mrs. W. Graham, Mrs. A. Little and Mrs. M. Dempsey.

Spooner Pond held an unusual contest, won by Mrs. D. Goodfellow, about: "What do you know about sleep?" To the question "What area would you like to visit?" were the answers: the British Isles, New Zealand, Hawaii, and Alaska.

The members at **Cleveland** voted to give money for prizes to the St. Frances School and also to the Richmond Fair. **Denison Mills** sent flowering bulbs to shut-ins and made five sewing bags for Somalia. **Shipton** also took an interest in the demand for sewing bags for Somalia. An article was read on the theme: "I am sick of the sick society."

Abbotsford's Education Convener gave hints on old fashioned ways to keep well. The Agriculture Convener spoke about tuberous begonias. Handicrafts made by members were on display at the meeting and a birthday cake in honour of Mrs. Ferris's 90th birthday was served.

Mrs. N. Coupland of **Granby Hill** had compiled some recipe books, used in the past, and handed these out. A contest on synonyms was held and won by Mrs. Helen Shanks. The branch gave a donation in memory of a Charter Member to the Waterloo Hospital. It was a special chair for shampooing hair and was the suggestion of the Director of the Hospital. The Home Economics Convener recommended freezing bananas if there is a sale and using them later for cakes. The Education Convener invited Mrs. J. Weideman from the Adult Education Services of the District of Bedford School Board. She told the audience that in their own area there are many adults who cannot read or write. She showed books used in helping these people to learn the basics and explained that they were looking for volunteers to work with the illiterates. (Many people having difficulty with reading and writing in English are immigrants who came to Canada as grown-ups. They learned the spoken word very quickly but had more difficulty with the written word. I remember my own time as an immigrant and that is the main reason why my husband and I published a German weekly newspaper. It gave other immigrants the opportunity to take part in Canadian events by reading about them in their mother tongue.)

Granby West made quite a lot of donations to: Camp Garagora, the Royal Victoria Hospital, Muscular Distrophy, the Wales Home, Butter's Foundation, and to the Austistic Children in Montreal.

Three sewing bags were made and filled for Somalia by **Waterloo-Warden** as well as a quilt for a child. The motto for the month was "You never get a second chance to make a first impression!" The guest speaker was from the local Courville Nursing Home and spoke about nutrition there.

The special program of the month at **Ascot** was making and filling the sewing kits for Somalia. Scotland was chosen as a favourite country to visit. A cookie and doughnut contest was held with prizes going to Marion Annesley for doughnuts and Rita Nugent for cookies. Miss Allison Booth won the Ascot WI Bursary. Mrs. Wm. Pearson paid fitting tribute to Hazel Coates, citing offices she had held in Provincial, County, and Branch (Ascot). Mrs. Coates was a person of many talents and abilities: an historian, musician, teacher, and keenly interested in all about her. In competition with WI members across Canada, she compiled a history of Ascot that won the Tweedsmuir Trophy for the best Village History. She also wrote

"Quebec Mosaic" a history of crafts as well as other pamphlets for the Quebec Women's Institutes. A moment of silence was observed in her memory.

Belvidere members had as guest speaker Mrs. Doris Conley who had been on a tour of Russia. She showed slides of the places and beautiful countryside that she had visited. Mrs. Conley was warmly thanked for the travelogue and was presented with a WI spoon in appreciation. A donation was voted to the First Lennoxville Boy Scouts Group towards sending a group of boys to the National Jamboree to be held in Alberta in July. The Citizenship Convener, Mrs. M. Smart, read an article re Girl Scouts carrying the ACWW flag in a Memorial Day parade. As the girls marched, the meaning of the flag was explained over a loud speaker. Sewing kits were assembled to be sent to Somalia. Welfare and Health Convener, Hazel McGee, received used greeting cards, stamps, computer lines, and eye glasses. A remedy for cracked heels was read: Soak feet in warm water each day for 20 minutes. Dry and rub on a medicated cream.

Brompton Road also made sewing kits. A gift was presented to Mrs. Lillian Sayer who, with her husband, celebrated their 60th wedding anniversary. Money and five pairs of socks, made by Mrs. D. Hadenko, were donated to the Cancer Society. A donation was given to the Lennoxville Boy Scouts. Two members, Betty Emery and Beth Cullen, made 675 cancer dressings. Josee Leblond of the Alexander Galt Regional High School was the winner of a Bursary given by this branch.

The Education Convener, Dr. Kathleen Atto, was in charge of the program at **Lennoxville.** The speaker, Mrs. J. Rourke from the Lennoxville School Board office, spoke on programs being made available to handicapped or disabled persons. Donations were voted to the Lennoxville Boy Scouts and to the Scholarship and Bursary Fund of the Alexander Galt Regional High School. Mrs. Warren Ross, Convener for Home Economics, drew attention to the upcoming craft competitions and gave hints for cooking substitutes.

Milby presented the Cornelia-Orr Memorial Award to Wendy Johnson at Alexander Galt High School. A cookie contest was held and prizes were awarded to Mrs. William Suitor, Mrs. Kirby, and Mrs. Cairns.

Donations to the Stoddard Rest Home, Butter's and Dixville Homes and Maplemount Home for young people were made by **Hatley.** They are busy bees making saleable items for the annual May Fair.

Beebe packed and delivered 33 baskets for sick, shut-ins, and senior citizens. **Stanstead North** made up 15 baskets; **Hatley Centre** presented a gift of books to their elementary school for the library, and all branches made and filled sewing bags for Somalia.

After having read all your reports, I have the feeling that Somalia must be over-flowing with sewing bags. As I heard at the November Board Meeting of the request for these bags, I doubted a bit that the response would be so satisfying. But I am overwhelmed by the results of what you members have done and Miss Anne Pearson, Director of Housing and Educational Programs for YM-YWCA and Mrs. Hana Aden, the Director in Somalia, can be very proud of the results. I hope to see you all at Convention at Macdonald and, may I beg you again, please print names.

Ruth von Brentani
QWI Publicity Convener

The QWI Executive at their February meeting. Top: President Mrs. I. Kilgour and 1st Vice Mrs. G. Parker. Below, left to right: Past President Miss E. Smith, Treasurer Mrs. D. Cascadden, 2nd Vice Mrs. D. Henderson, 3rd Vice Mrs. L. French, Secretary Mrs. S. Washer, and (backs to camera) Mrs. Kilgour and Mrs. Parker.

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